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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/720,136	11/25/2003	Ikunao Isomura	245733US2SRD	4417
22850 7590 05/02/2007 OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314				
			EXAMINER LIEW, ALEX KOK SOON	
			ART UNIT 2624	PAPER NUMBER
			NOTIFICATION DATE 05/02/2007	DELIVERY MODE ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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<b>Office Action Summary</b>	<b>Application No.</b> 10/720,136	<b>Applicant(s)</b> ISOMURA ET AL.	
	<b>Examiner</b> Alex Liew	<b>Art Unit</b> 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 25 November 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4,8-11 and 16-22 is/are rejected.
- 7) ☒ Claim(s) 5-7 and 12-15 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Objections*

Claims 5 – 7 and 12 – 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

With regards to claim 5, the examiner cannot find any applicable prior art and / or suggestions disclosing the repeated pattern area detector detects whether candidates for the plurality of repeated pattern areas exist in the second detected pattern data, measures area sizes of the candidates with a first optical magnification lower than an optical magnification of the first imaging optics *if the candidates exist, re-acquires* image data of the pattern with a second optical magnification higher than the first optical magnification within the detected area sizes, judges a coincidence degree of the candidates on the basis of the re-acquire image data, and registers the candidates, when judged to coincide, as the plurality of repeated pattern areas in combination with all the limitations of claim 1.

With regards to claim 12, see the rationale for claim 5.

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1 – 4, 8 – 11 and 16 – 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Specht (US pat no 4,805,123) in view of Jun (US pat no 6,366,688) and Tsai (US pat no 4,845,558).

With regards to claim 1, Specht discloses a pattern inspection apparatus, which performs die-to-die inspection of comparing detected pattern data of one area with detected pattern data of another area among a plurality of repeated pattern areas (see fig 1 – 10), comprising

- first imaging optics which forms first optical image of a pattern formed on an inspection target plate on the basis of design pattern data (see fig 1 – 18),
- a detected pattern data generator which detects the first optical image and generates first detected pattern data (see col. 5 lines 16 – 21 – the input data from the wafer gets converted into image pixel data),
- second imaging optics which forms second optical image of a pattern formed on an inspection target plate on the basis of design pattern data (see fig 1 – 20),
- a detected pattern data generator which detects the second optical image and generates second detected pattern data (again see col. 5 lines 16 – 21) and
- a comparator which sequentially compares the first and second input data of the repeated pattern areas to perform die-to-die comparison (see fig 10 – the input

data from the left and right die are compared with each other and defects are detected using image difference).

Specht does not using the second imaging means to capture the image of the entire wafer and detects repeating patterns from the image obtained from the second imaging means. Jun discloses an imaging means, which forms second optical image of the pattern, the imaging optics serving to scan an entire region of the pattern on the inspection target plate (see fig 28 – the electron beam scans the entire region of the pattern, at 520 and 524, it checks if all the pixel in the vertical and horizontal, respectively, had been scanned, also see col. 18 lines 43 – 44) and a repeated pattern area detector, which detects the plurality of repeated pattern areas from the detected pattern data (see col. 19 lines 3 – 18, also see the invention of Jun does not only detects holes it also detects other repeated patterns, col. 20 lines 27 – 30). One skill in the art would include imaging entire pattern region means and detect repeated pattern means because those repeated patterns are most likely ones that have defects in them (see Jun col. 19 lines 19 – 36) and detecting the repeated patterns will locate the defect in the wafer and improve inspection process.

Jun teaches only using one magnification to scan the entire region of the wafer pattern (see col. 11 lines 48 – 51) not using a plurality of magnifications to find repeated patterns. Tsai teaches using plurality of magnifications to observe a region of the wafer shown in figure 2 and then selects a part of the region, figure 2 – 30, to inspect if there is any defects in greater magnification, figure 3, with 40, 42, 44 and 45 being the areas to be inspected. One skill in the art would include different magnifications for

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semiconductor inspection because to align the wafer for imaging to obtain correct locations of defects (see Tsai col. 3 lines 21 – 27), improving inspection process.

One of Specht's imaging means, figure 1 – 20, modified by Jun's imaging means and combined with the plurality of magnification disclosed by Tsai disclose the current claimed invention of claim 1.

With regards to claim 2, Specht discloses an apparatus according to claim 1, wherein the repeated pattern area detector detects the plurality of repeated pattern areas by pattern matching on the basis of a similarity on a pattern layout of the second detected pattern data (see fig 10 – the left image is matched with the right image to find defects).

With regards to claim 3, Specht discloses an apparatus according to claim 2, wherein the similarity in the pattern includes a pitch and size of the plurality of repeated pattern areas (see fig 10 – the pitch of the left and right images is 4 pixels and the size of the left and right images are 2 X 2).

With regards to claim 4, Specht discloses an apparatus according to claim 1, wherein the repeated pattern area detector further performs detection of the plurality of repeated pattern areas on the basis of the design pattern data (see figure 10 – the design of those left and right images are to have a dark pixels in the upper left corner of the image window).

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With regards to claim 8, an extension to the rejection of claim 1, Tsai discloses those repeated patterns having rectangular shapes (see fig 3 – the vertical length of each die is longer than the horizontal length). Whether detecting square, rectangular or any other generic shapes, it is just a matter of design as to how the dies are manufactured and does not change the image processing steps of the system. One skill in the art would include a rectangular shape die because it can be easily manufacture, which takes less time to send to the market.

With regards to claim 9, an extension to the rejection of claim 8, the size of the die does not change the image processing steps needed to inspect the dies, and semiconductor electronic of various sizes are well known (MPEP 2144.03). One skill in the art would choose a size of 1 mm square or less because to manufacture more chips with lesser which improve productivity and profit gain.

With regards to claim 10, the first and second images of the left and right dies, respectively, are obtained, then it detects the defects between the first and second images, as shown in Specht, figure 1 and 10. The second imager is replaced by Jun's image capturing device, which scans an entire region and Tsai discloses the plurality of magnification used in scanning the individual die and an entire region of a wafer. The combination of Specht, Jun and Tsai disclose the claimed invention of claim 10.

With regards to claim 11, see the rationale and rejection for claim 1.

With regards to claim 16, see the rationale and rejection for claim 8.

With regards to claim 17, see the rationale and rejection for claim 9.

With regards to claim 18, see the rationale and rejection for claim 10.

2. Claims 19 – 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Specht ('123) in view of Jun ('688).

With regards to claim 19, Specht discloses a pattern inspection apparatus, which performs die-to-die inspection of comparing detected pattern data of one area with detected pattern data of another area among a plurality of repeated area (see fig 1 – 18 and 20 – the inspected data are comparing die from a wafer), and die-to-database inspection of comparing the detected pattern data with reference pattern data obtained from design pattern data (see col. 3 lines 28 – 34 – inspected image is compare with a reference image to properly align the inspected image), comprising

- imaging optics which form an optical image of a pattern formed on an inspection target plate on the basis of the design data (see fig 1 – 18 and 20 are the imaging optics),
- a detected pattern data generator which detects the optical image and generates the detected pattern data (see col. 5 lines 16 – 21) and



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- a comparator which sequentially compares a plurality of detected pattern areas on the second detected pattern data corresponding to the plurality of repeated pattern areas detected by the repeated pattern area detector in accordance with die-to-die comparison (see fig 10 – the defect(s) are found using image difference using the left and right images).

Specht does not using the second imaging means to capture the image of the entire wafer and detects repeating patterns from the image obtained from the second imaging means. Jun discloses an imaging means, which forms second optical image of the pattern, the imaging optics serving to scan an entire region of the pattern on the inspection target plate (see fig 28 – the electron beam scans the entire region of the pattern, at 520 and 524, it checks if all the pixel in the vertical and horizontal, respectively, had been scanned, also see col. 18 lines 43 – 44) and a repeated pattern area detector, which detects the plurality of repeated pattern areas from the detected pattern data (see col. 19 lines 3 – 18, also see the invention of Jun does not only detects holes it also detects other repeated patterns, col. 20 lines 27 – 30). One skill in the art would include imaging entire pattern region means and detect repeated pattern means because those repeated patterns are most likely ones that have defects in them (see Jun col. 19 lines 19 – 36) and detecting the repeated patterns will locate the defect in the wafer and improve inspection process.

With regards to claim 20, whether detecting square, rectangular or any other generic shapes, it is just a matter of design as to how the dies are manufactured and does not

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change the image processing steps of the system. One skill in the art would include a rectangular shape die because it can be easily manufacture, which takes less time to send to the market.

With regards to claim 21, an extension to the rejection of claim 20, the size of the die does not change the image processing steps needed to inspect the dies, and semiconductor electronic of various sizes are well known (MPEP 2144.03). One skill in the art would choose a size of 1 mm square or less because to manufacture more chips with lesser which improve productivity and profit gain.

With regards to claim 22, the first and second images of the left and right dies, respectively, are obtained, then it detects the defects between the first and second images, as shown in Specht, figure 1 and 10. The second imager is replaced by Jun's image capturing device, which scans an entire region. The combination of Specht and Jun disclose the claimed invention of claim 22.

### **Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alex Liew whose telephone number is (571)272-8623. The examiner can normally be reached on 9:30AM - 7:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Mancuso can be reached on (571)272-7695. The fax phone

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number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

**Alex Liew**  
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**4/17/07**



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